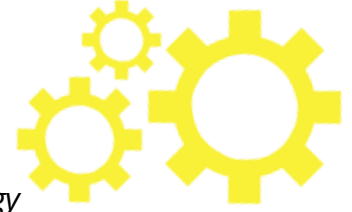


OUR MISSION

INL's K-12 STEM Program works to inspire Idaho's future STEM workforce, impact students, teachers and families by integrating best practices in STEM education, and empower employees to become STEM mentors to transform K-12 STEM into a driver for innovation.

BALLOON CAR OVERVIEW

At the INL, engineers are working on developing batteries for next generation concepts. One of these concepts is working with automobile manufactures to advance energy storage technologies and find different energy sources, such as nuclear power to support electric vehicles. Electric vehicles are considered clean energy or renewable energy, which means the emissions from the car do not pollute the air or the water. This project is also important because it is working towards energy security by reducing the need for foreign energy sources.



Students will use the engineering design process to construct a balloon car relating to how INL engineers are working with automobile manufactures to advance energy source technologies.

SCIENCE BEHIND IT

Air is not just empty space- it has mass and is made up of molecules. A molecule is a group of atoms bonded together. These molecules of air are constantly moving. The air in our atmosphere is made up of molecules of different gases. The most common gases are nitrogen and oxygen. When air is blown into the balloon, the molecules push against the walls of the latex balloon. Because of the elasticity of the balloon, the balloon will grow as more molecules of air are added. As long as the hole is plugged, the balloon stays inflated, trapping the air molecules inside. When pressure is removed by opening the hole, the air molecules will escape.

VOCABULARY

ENGINEER: *a person who invents, designs, builds, analyzes, and tests machines, systems, structures and materials to solve problems*

CLEAN ENERGY: *energy that is produced through means that do not pollute the atmosphere*

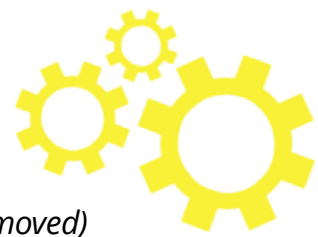
FOREIGN: *from another country*



* This lesson meets NGSS Standards 3-5-ETS1-1, 3-5-ETS1-2 and 3-5-ETS1-3

MATERIALS

- 4 milk bottle lids (available at craft stores)
- straw
- nail and hammer
- balloon
- piece of cardboard
- 1 pen that (ink can be removed)
- 2 skewer
- clear tape



RESEARCH AND DESIGN PROCESS

RESEARCH QUESTIONS

- *Why is the size of the balloon important?*
- *Does it matter what size the cardboard “body” is?*
- *What other materials could be used for wheels?*

PROCEDURES

1. *Using the nail, hammer a hole into the middle of all four milk bottle lids.*
2. *Cut the piece of cardboard to size desired (this is the body of the car)*
3. *Decide where to place the axels (skewers) on the cardboard. Cut axels to fit cardboard. (An axel is the part of the car that keeps the wheels attached to the car)*
4. *Tape down axels to the cardboard*
5. *Attach one set of wheels to each end of the axel.*
6. *Take ink container out of pen (the ink will not be needed for this project).*
7. *Attach a balloon to one end of the pen tube, make sure to completely tape around the balloon making sure no air can escape.*
8. *Then tape the pen tube to the cardboard.*
9. *Make sure to leave one end of the pen tube open so that you can blow up the balloon.*
10. *Blow up the balloon, plug the pen tube hole, place on hard surface, remove your finger and let the air out of the balloon.*

EXTENSIONS

- *Research the history of electric cars.*
- *Design an electric car for the future.*
- *What other ways have been used to power cars?*

DID YOU KNOW

An electric vehicle (EV) has far fewer moving parts than a conventional gasoline-powered vehicle, so there's no need for liquid fuels or oil changes. Plus there are fewer maintenance costs on EVs. EVs have fewer harmful gaseous emissions into the air and are just as reliable as gas powered vehicles.

DID YOU KNOW

<https://www.energy.gov/eere/electricvehicles/electric-vehicle-benefits>
https://www.youtube.com/watch?v=QzY9RH_JnL0
<https://inl.gov/inl-initiatives/education/k-12-stem/>
https://factsheets.inl.gov/FactSheets/Advanced_Transportation.pdf

